

## B. Nervous System Physiology

### PURPOSE

Unit 7B will familiarize you with some of the physiological aspects of the nervous system.

### OBJECTIVES

After completing Unit 7B, you will be able to

- identify and demonstrate selected reflexes in the human being.
- perform tests for cranial nerve and cerebellar function.
- identify selected characteristics of nerve impulse transmission in the frog.
- identify selected spinal reflexes in the frog.

### MATERIALS

live frogs	dissecting instruments
1% HCl solution	facial tissues
Ringer's solution	5% acetic acid
rubber reflex hammer	penlight
pans of water	coffee, tobacco, or spices
electric stimulator	cotton
physiological recording device	cotton-tipped applicator
10% NaCl solution	stopwatch
10% sugar solution	tuning fork (512 cycles per second)
tongue depressors	swivel chair
disposable gloves	

### PROCEDURE

Nerves conduct impulses upon stimulation. For a nerve to be excitable and to change from a resting state to a conducting state, a difference in ionic concentration must exist between the external and internal surfaces of the cell membrane. Conductivity results from a change in ionic concentration from the point of stimulation and extends along the nerve.

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### EXERCISE 1

#### Human Reflexes

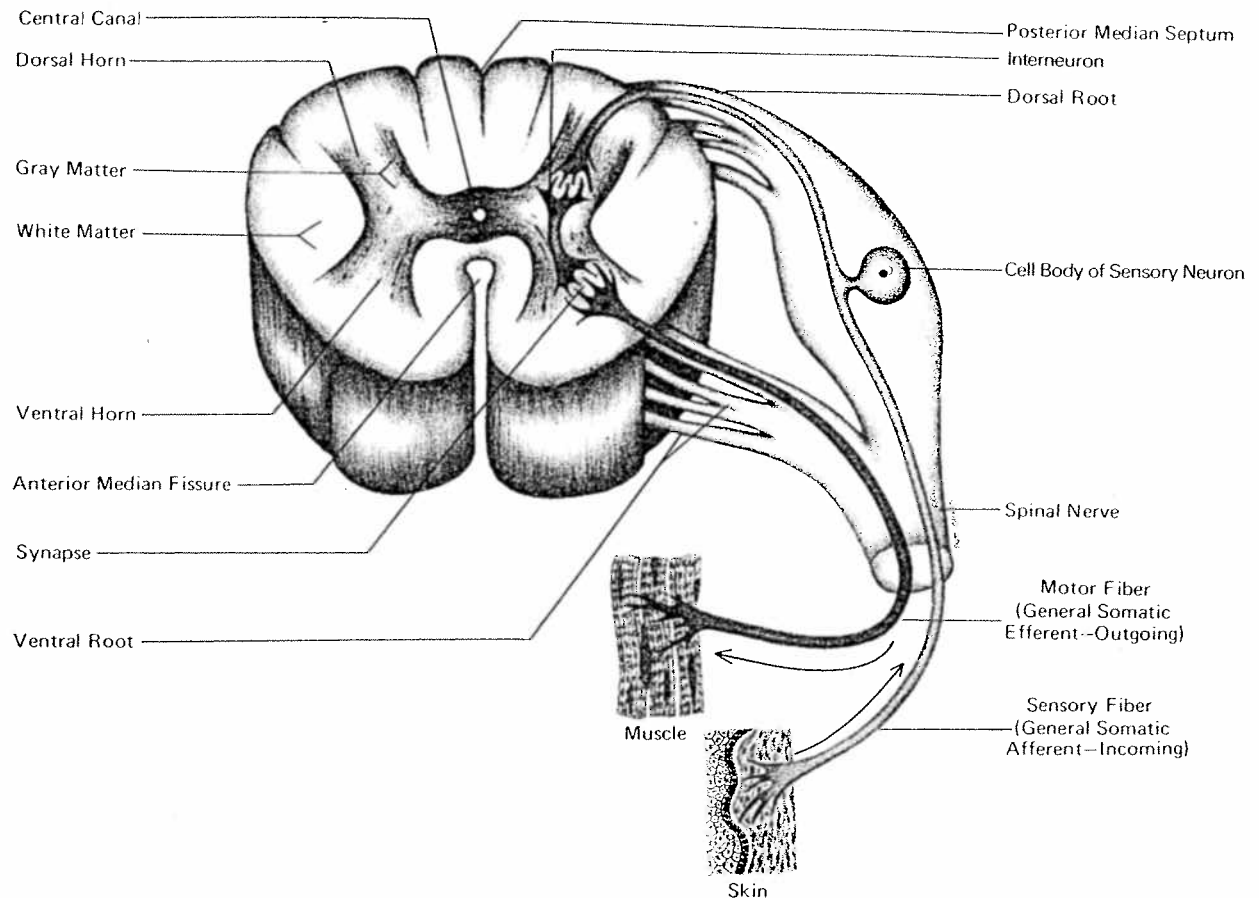
A reflex is a rapid, involuntary motor response to a specific stimulus. A reflex arc consists of five components: a receptor, sensory neuron, interneuron, motor neuron, and effector (muscle or gland). (See Figure 7.14.)

#### The Swallowing Reflex

Swallow the saliva in your mouth and immediately swallow again. Explain your result and compare it to the rapid succession of swallowing demonstrated by rapidly drinking a glass of water.

### QUESTIONS

Try to stop yourself from swallowing. Explain your response in terms of a reflex action.

**Figure 7.14** A reflex arc**The Patellar Reflex**

Sit so that your legs hang down freely from the knees. Have another student strike the patellar ligament (just below the knee) with the flat posterior portion of a rubber reflex hammer. This experiment may require a little patience, and it is best to divert the subject's attention. Notice that the leg is extended by the contraction of the quadriceps muscle group. Repeat on another student. Record your data (Figure 7.14).

**QUESTION**

*Is the reflex obtained just as readily, and is it equally extensive for all students?*

**Photo-Pupil Reflex**

Close your eyes for two minutes. While facing a bright light, open them and let another student examine your pupils immediately. Describe the response.

**QUESTION**

*What is the purpose of this reflex action?*

**The Accommodation Reflex**

In a moderate light, look at a distant object (20 ft or more removed) and have another student examine your pupils. Now look at a pencil held about 10 in. from your face (without changing the illumination) and have your partner note your pupils. Result?

**QUESTION** *What is the purpose of this reflex?*

**Convergence Reflex**

Look at a pencil held 36 in. away. Have another student note the position of your eyeballs. Have your partner slowly bring the pencil closer until it nearly touches your nose. What change is observed in your eyeballs? This effect is called convergence.

**QUESTION** *What is the purpose of this reflex?*

**The Achilles or Ankle Jerk**

Kneel on a chair; let your feet hang freely over the edge of the chair. Bend your foot to increase the tension of the gastrocnemius muscle. Have your partner tap the tendon of Achilles with a rubber reflex hammer.

**QUESTION** *What reflex results?*

**Corneal Reflex**

Gently touch the cornea of your eye with a piece of facial tissue. What is the result?

**QUESTION** *What is the purpose of this reflex?*